

## Claims

We claim:

1. A memory medium comprising program instructions for creating a measurement run-time, comprising:
- 5 a measurement task specifier, operable to generate a measurement task specification for a measurement task in response to user input;
- an expert system, operable to analyze the generated measurement task specification and generate a run-time specification for the measurement task;
- 10 wherein the run-time specification is useable to:
- configure one or more measurement devices according to the run-time specification; and
- generate a run-time, wherein said run-time is executable to perform the measurement task.
- 15 2. The memory medium of claim 1, further comprising a run-time builder, operable to:
- analyze the run-time specification;
- configure one or more measurement devices according to the run-time specification; and
- 20 generate a run-time, wherein said run-time is executable to perform the measurement task.
3. The memory medium of claim 2, wherein said run-time builder is further operable to:
- 25 reserve one or more resources according to the selected run-time specification in response to said analyzing the selected run-time specification.

4. The memory medium of claim 2, wherein said run-time builder is further operable to:

analyze changes made to the run-time specification; and  
change configuration of said one or more measurement devices in response to said  
5 analyzing, wherein the configuration changes correspond to said changes made to the run-time specification.

5. The memory medium of claim 2, wherein the expert system is further operable to:

10 analyze incremental changes made to the measurement task specification; and  
populate one or more run-time specification change lists with measurement  
primitive settings;

wherein the run-time builder is further operable to:

15 modify the run-time based on said one or more run-time specification  
change lists.

6. The memory medium of claim 1, wherein the memory medium stores one or more of:

the generated measurement task specification;  
20 the generated run-time specification; and  
configuration information for the one or more measurement devices.

7. The memory medium of claim 1,  
wherein the memory medium further stores one or more measurement primitives;  
25 and

wherein said generated run-time specification comprises a specification of the  
parameters of one or more of the measurement primitives.

8. The memory medium of claim 7, wherein each measurement primitive comprises a software object and corresponding configuration settings, and wherein each measurement primitive is operable to implement at least a portion of the measurement task.

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9. The memory medium of claim 1, wherein the measurement task specifier comprises an Application Programming Interface (API).

10. The memory medium of claim 1, wherein the measurement task specifier is operable to be invoked from an application development environment.

11. The memory medium of claim 10, wherein the application development environment comprises one of a text-based or graphical programming-based application development environment.

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12. The memory medium of claim 1, wherein the measurement task specifier is operable to be launched from one or more of: an application development environment toolbar or an application development environment menu.

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13. The memory medium of claim 1, wherein the measurement task specifier is operable to be presented as a properties page of an Active X control.

14. The memory medium of claim 1, wherein the measurement task specifier is operable to be invoked by receiving user input to an icon.

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15. The memory medium of claim 1, wherein the measurement task specifier is operable to be invoked by receiving user input to a node in a graphical program.

16. The memory medium of claim 1,

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wherein the memory medium is comprised in a computer-based measurement system; and

wherein the computer-based measurement system includes the one or more measurement devices, wherein the one or more measurement devices are operable to  
5 respectively perform portions of the measurement task.

17. The memory medium of claim 1,  
wherein the memory medium is comprised in a computer program including a display;  
10 wherein the measurement task specifier is operable to present one or more panels on the display for receiving the user input.

18. The memory medium of claim 1,  
wherein the measurement task specification comprises a data structure comprising  
15 the user input received by the measurement task specifier or measurement API.

19. The memory medium of claim 1,  
wherein the measurement task specifier comprises a measurement task configuration tool which is operable to generate measurement task code in response to  
20 said user input, wherein said measurement task code comprises one or more of a text-based program, a graphic-based program, and a prototype-based program.

20. The memory medium of claim 19, wherein said measurement task code comprises one or more of: C code; C++ code; Java; Visual Basic; and .NET code.  
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21. The memory medium of claim 19, wherein said measurement task code comprises a measurement task diagram.

22. The memory medium of claim 21, wherein said measurement task diagram comprises a graphical program.

23. The memory medium of claim 21, wherein said graphical diagram  
5 comprises a LabVIEW graphical program.

24. The memory medium of claim 1,  
wherein said expert system comprises a plurality of experts;  
wherein said expert system is further operable to:  
10 analyze the generated measurement task specification;  
select and invoke one or more of the plurality of experts to analyze the  
generated measurement task specification and populate one or more candidate run-time  
specifications;  
calculate one or more metrics for each of the populated candidate run-time  
15 specifications; and  
select one of the populated candidate run-time specifications based on the  
calculated metrics;  
wherein the selected populated candidate run-time specification comprises at least  
a portion of said generated run-time specification of the measurement task.

20  
25. The memory medium of claim 1, further comprising:  
a device and resource configuration tool, wherein the device and resource  
configuration tool is operable to receive second user input, and to set system  
configuration parameters for the one or more measurement devices in response to said  
25 second user input.

26. The memory medium of claim 1, wherein the expert system is further  
operable to validate the measurement task specification.

27. The memory medium of claim 1, wherein the measurement task comprises a plurality of measurement sub-tasks.

28. The memory medium of claim 1, wherein the measurement task comprises  
5 a complex measurement operation using a plurality of measurement devices.

29. The memory medium of claim 1, wherein at least one of the one or more measurement devices comprises a hardware measurement device.

10 30. The memory medium of claim 1, wherein at least one of the one or more measurement devices comprises a virtual measurement device.

31. A memory medium comprising program instructions for creating a measurement run-time, comprising:

15 a measurement task specifier, operable to generate a measurement task specification for a measurement task in response to user input;

an expert system, operable to:

analyze the generated measurement task specification;

validate the measurement task specification; and

20 generate a run-time specification for the measurement task; and

a run-time builder, operable to:

analyze the run-time specification;

reserve one or more resources according to the run-time specification after said analyzing the run-time specification;

25 configure one or more measurement devices according to the run-time specification; and

generate a run-time, wherein said run-time is executable to perform the measurement task.

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32. / A method for performing a measurement task, the method comprising:  
receiving user input specifying the measurement task;  
generating a measurement task specification in response to said user input;  
analyzing the measurement task specification, and generating one or more  
5 candidate run-time specifications for the measurement task in response to said analyzing;  
calculating one or more metrics for each of the one or more candidate run-time  
specifications and selecting one of the one or more candidate run-time specifications  
based on the calculated metrics;  
analyzing the selected run-time specification;  
10 configuring one or more measurement devices according to the selected run-time  
specification; and  
generating a run-time based on the selected run-time specification, wherein said  
run-time is executable to perform the measurement task.

15 33. The method of claim 32, further comprising:  
reserving one or more resources according to the selected run-time specification  
after said analyzing the selected run-time specification.

20 34. The method of claim 32, further comprising:  
validating the generated measurement task specification in response to said  
analyzing the measurement task specification.

35. The method of claim 32, further comprising:  
storing one or more of the generated measurement task specification, the generated  
25 run-time specification, and configuration information for the one or more measurement  
devices.

36. The method of claim 32, further comprising:  
analyzing changes made to the run-time specification; and

changing configuration of said one or more measurement devices in response to said analyzing, wherein the configuration changes correspond to said changes made to the run-time specification.

5           37.       The method of claim 32, further comprising:  
analyzing incremental changes made to the measurement task specification; and  
populating one or more run-time specification change lists with measurement  
primitive settings; and  
modifying the run-time based on said one or more run-time specification change  
10   lists.

38. The method of claim 32, further comprising:  
executing said run-time to perform the measurement task.

15            39.        The method of claim 32,  
                 wherein said run-time specification comprises a specification of the parameters of  
                 one or more measurement primitives, wherein each measurement primitive comprises a  
                 software object and corresponding configuration settings, and wherein each measurement  
                 primitive is operable to implement at least a portion of the measurement task.

40. The method of claim 32, further comprising:  
generating measurement task code in response to said user input.

41. The method of claim 40,  
25 wherein said measurement task code comprises one or more of C code, C++ code,  
Java code, Visual Basic, and .NET code.

42. The method of claim 32, further comprising:  
generating a measurement task diagram in response to said user input.



43. The method of claim 42,  
wherein said measurement task diagram comprises a graphical program.

5 44. The method of claim 43,  
wherein said graphical program comprises a LabVIEW graphical program.

45. The method of claim 32, further comprising:  
receiving second user input; and  
10 setting system configuration parameters for the one or more measurement devices  
in response to said receiving second user input.

46. The method of claim 32, wherein the measurement task comprises a  
plurality of measurement sub-tasks.

15 47. The method of claim 32, wherein the measurement task comprises a  
complex measurement operation using a plurality of measurement devices.

48. The method of claim 32, wherein at least one of the one or more  
20 measurement devices comprises a measurement hardware device.

49. The method of claim 32, wherein at least one of the one or more  
measurement devices comprises a virtual measurement device.

25 50. / A method for performing a measurement task, the method comprising:  
receiving user input specifying the measurement task;  
generating a measurement task specification in response to said user input;  
analyzing the measurement task specification, and generating a run-time  
specification for the measurement task in response to said analyzing;

analyzing the run-time specification;  
configuring one or more measurement devices according to the run-time  
specification; and  
generating a run-time based on the run-time specification, wherein said run-time  
5 is executable to perform the measurement task.

51. The method of claim 50, further comprising:  
receiving second user input; and  
setting system configuration parameters for the one or more measurement devices  
10 in response to said receiving second user input.

52. The method of claim 50, wherein the measurement task comprises a  
plurality of measurement sub-tasks.

53. The method of claim 50, wherein the measurement task comprises a  
15 complex measurement operation using a plurality of measurement devices.

54. The method of claim 50, wherein at least one of the one or more  
measurement devices comprises a measurement hardware device.

55. The method of claim 50, wherein at least one of the one or more  
20 measurement devices comprises a virtual measurement device.

56. A measurement system, comprising:  
25 a measurement task specifier, operable to generate a measurement task  
specification for a measurement task in response to user input;  
an expert system, operable to:  
analyze the generated measurement task specification;  
validate the generated measurement task specification; and

generate a run-time specification for the measurement task;  
a run-time builder, operable to:

analyze the run-time specification;

configure one or more measurement devices according to the run-time  
5 specification; and

generate a run-time, wherein said run-time is executable to perform the  
measurement task.

57. The measurement system of claim 56, wherein the run-time builder is  
10 further operable to:

reserve one or more resources according to the run-time specification in response  
to said analyzing the selected run-time specification.

58. The measurement system of claim 56, wherein said run-time builder is  
15 further operable to:

analyze changes made to the run-time specification; and

change configuration of the one or more measurement devices in response to said  
analyzing, wherein the configuration changes correspond to said changes made to the run-  
time specification.

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59. The memory medium of claim 56, wherein the expert system is further  
operable to:

analyze incremental changes made to the measurement task specification; and

populate one or more run-time specification change lists with measurement  
25 primitive settings;

wherein the run-time builder is further operable to:

modify the run-time based on said run-time specification change list.

60. The measurement system of claim 56, wherein the measurement task specifier comprises an Application Programming Interface (API).

61. The measurement system of claim 56, further comprising:

5 a storage system which is operable to store one or more of:

the generated measurement task specification;

the generated run-time specification; and

configuration information for the one or more measurement devices.

10 62. The measurement system of claim 56, wherein said generated run-time specification comprises a specification of the parameters of one or more measurement primitives, wherein each measurement primitive comprises a software object and corresponding configuration settings, and wherein each measurement primitive is operable to implement at least a portion of the measurement task.

15 63. The measurement system of claim 56, wherein the measurement task specifier is operable to be invoked from a text-based application development environment.

20 64. The measurement system of claim 56, wherein the measurement task specifier is operable to be launched from an application development environment toolbar.

25 65. The measurement system of claim 56, wherein the measurement task specifier is operable to be invoked from an application development environment menu.

66. The measurement system of claim 56, wherein the measurement task specifier is operable to be presented as a properties page of an Active X control.

67. The measurement system of claim 56, wherein the measurement task specifier is operable to be invoked by receiving user input to an icon.

68. The measurement system of claim 56, further comprising:  
5 the one or more measurement devices which are operable to respectively perform portions of the measurement task.

69. The measurement system of claim 56, wherein said measurement task specifier is operable to generate measurement task code in response to said user input.  
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70. The measurement system of claim 69, wherein said measurement task code comprises C code.

71. The measurement system of claim 69, wherein said measurement task  
15 code comprises C++ code.

72. The measurement system of claim 69, wherein said measurement task code comprises Visual Basic code.

73. The measurement system of claim 69, wherein said measurement task  
20 code comprises Java code.

74. The measurement system of claim 69, wherein said measurement task code comprises .NET code.  
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75. The measurement system of claim 56, wherein said measurement task specifier is operable to generate a measurement task diagram in response to said user input.

76. The measurement system of claim 75, wherein said measurement task diagram comprises a graphical program.

77. The measurement system of claim 76, wherein said graphical program  
5 comprises a LabVIEW graphical program.

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